

Section 5.3

The DSM2 model simulation of the SDIP Stage 1 did not properly include the dredging in Middle River. The dredging of Middle River will allow higher flows during flood events, and allows slightly higher tidal circulation with the proposed tidal gate operations. The DSM2 modeling has been modified to include the dredging in Middle River, and some reduced salinity results for Middle River at Mowry Bridge and Grant Line Canal at Tracy Boulevard Bridge were obtained. There were no simulated changes in EC at the CCWD Old River intake (SR 4) or at the CCWD Rock Slough intake. The corrected results are given in Table 5.3-1 below (page 5.3-30).

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

that are expected to reduce salinity at CCWD intakes. CCWD has agreed that these benefits will be considered along with the potential impacts from operating the tidal gates and pumping additional water at SWP Banks when judging the overall protection of water quality as described in the CALFED ROD.

All salinity impacts were found to be less than significant because changes would be within the large variations that are characteristic of the no action baseline conditions in the Delta. Salinity changes in many south Delta channels were found to be significantly beneficial, because the reductions were greater than 5% of the baseline value. These salinity benefits are the result of tidal gate operations that produce a tidal circulation of Sacramento River water that is drawn toward the CVP Tracy and SWP Banks. The changes in DOC at drinking water intakes were also found to be less than significant compared with the no action baseline conditions, which are dominated by high DOC during storm inflows and from Delta agricultural drainage. Because the SDIP would not change the DOC loading patterns, the simulated changes from shifting the Delta channel flows and the corresponding fraction of high DOC inflows (i.e., agricultural drainage, San Joaquin River) that are exported were found to be relatively small.

The changes in DWSC flows resulting from the SDIP alternatives would have a beneficial effect on the DO conditions in the Stockton DWSC during the summer, because the head of Old River tidal gate will be operated to reduce the diversions of San Joaquin River water into the south Delta channels. Water quality impacts under cumulative conditions would be similar to the direct and indirect impacts described for SDIP alternatives.

Summary of Significant Impacts

There are no significant impacts on water quality as a result of implementation of the project alternatives. Operation of the tidal gates provides substantial improvements in salinity in the south Delta channels. ~~There are occasional slight increases in salinity occur in the CCWD intakes and at SWP Banks, but these are less than 5% of the baseline values.~~ The water quality benefits are less under Alternative 4B, which includes constructing only the head of Old River gate.

Affected Environment

Delta waters serve several beneficial uses, each of which has water quality requirements and concerns associated with it. The Delta is a major habitat area for important species of fish and aquatic organisms, as well as a source of water for municipal, agricultural, recreational, and industrial uses. Dominant water quality variables that influence habitat and food-web relationships in the Delta are temperature, salinity, suspended sediments (SS) and associated light levels for photosynthesis, DO, pH, nutrients (nitrogen and phosphorus), DOC, and

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-2

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

turbulence is strong enough to maintain relatively high DO concentrations. The DO concentrations in the Stockton DWSC are generally the lowest, with several episodes of DO concentrations of less than 5 mg/l.

The causes of these low DO episodes in the DWSC have been under investigation by the CVRWQCB and the San Joaquin River DO TMDL steering committee for the past several years (Central Valley Regional Water Quality Control Board 2003). Because reduced flows are thought to be one of the primary factors influencing low DO in the DWSC, the potential impact of SDIP alternatives on DO in the DWSC were evaluated. The SDIP alternatives may influence the flow in the DWSC and could therefore impact DO concentrations.

The DO measured in south Delta channels was generally higher than in the Stockton DWSC, although several episodes of reduced DO were recorded. Because the tidal flow velocities in the south Delta channels are relatively high, the severe DO depletion that has been measured in the DWSC is not expected to occur regularly in the south Delta channels.

Environmental Consequences

Assessment Methods

SDIP project operations may cause water quality effects in the Delta by three primary mechanisms:

- Increased SWP Banks pumping may produce lower Delta outflow and thereby increase the concentrations of EC levels and mineral constituents, such as Cl^- and Br^- that are associated with salinity intrusion from Suisun Bay.
- SDIP changes in exports or operation of tidal gates in the south Delta may change the mixture of San Joaquin River water and agricultural drainage in south Delta channels, which might change the EC levels and concentration of water quality constituents, such as Cl^- , Br^- , and DOC at municipal and agricultural diversions and export locations.
- SDIP changes in San Joaquin River flows moving past the head of Old River into the Stockton DWSC may cause changes in the concentrations of DO in the portion of the DWSC near Stockton. This portion of the DWSC is identified by the RWQCB as being out-of-compliance with the DO objective, which is 5 mg/l from December to August, and 6 mg/l from September through November (to protect migrating adult Chinook salmon). A technical TMDL report has been submitted to EPA describing the major reasons for the low DO conditions; low river flow has been identified as one of the major causes for the low DO. The low DO TMDL implementation plan has been adopted by the CVRWQCB and SWRCB.[kkl]

This section provides an overview of the application of DSM2 for the water quality impact assessment of the SDIP alternatives. DSM2 provides an accurate

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-15

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Because there are no measurements of agricultural drainage flows in the Delta, the MWQI measurements of DOC concentrations cannot be used directly to estimate the relative contributions of DOC from Delta agricultural land. Possible contributions of DOC from crop residue, wetlands plants, and peat soil leaching have not been directly measured. Several water quality experiments have been conducted to estimate these potential DOC source contributions for impact assessment purposes (Marvin Jung and Associates 1999). Results of these experiments are incorporated into the Delta Island Consumptive Use module of DSM2, which includes assumed monthly drainage volumes for each node in the model along with monthly estimates of drainage EC and DOC concentrations. These assumed drainage flows and EC values and DOC concentrations (see Appendix D) are assumed to hold constant between the 2001 and 2020 baselines, and to be the same for all SDIP alternatives. SDIP alternatives may, however, shift the contributions from the agricultural drainage DOC sources at the water supply intakes.

Methods for Assessing Impacts on Dissolved Oxygen

The simulated effects of SDIP alternatives on DO concentrations in the Stockton DWSC depend on the DSM2 simulated Stockton flows. The lower San Joaquin River is listed by the CVRWQCB as a Clean Water Act Section 303 impaired water body. The CVRWQCB initiated the preparation of a TMDL analysis in early 1999 and organized a forum for stakeholder involvement. A substantial amount of data collection has been conducted through CALFED stakeholders and funding.

The CVRWQCB has produced a series of reports on the Stockton DWSC low DO problem (Central Valley Regional Water Quality Control Board 2002). This series of reports includes a comprehensive analysis of the seasonal data collected in the fall by DWR (boat surveys) and by the City of Stockton (NPDES weekly compliance monitoring) as well as the hourly data collected by DWR at the Rough & Ready Island water quality monitoring station since 1983. The tidal flow at Stockton has been measured by a UVM device since 1995.

Daily minimum DO concentrations from each of these data sources from 1996 to 2001 correlated with flow (during the late-summer and fall period). The general relationship suggests that the DWSC minimum DO concentration will increase as the flow is increased to about 1,500 cfs. The average DO increase is apparently about 0.15 to 0.20 mg/l for each 100 cfs of increased flow.

For impact evaluation purposes, the assumed change in DO is 0.2 mg/l for each 100-cfs increase in flow. A reduction in DO of 0.2 mg/l will also be assumed for any 100-cfs reduction in flow, within the range of 0 cfs to 1,500 cfs of Stockton flow. The DO concentration at a flow of 1,500 cfs is estimated from the available data to be about 6.0 mg/l. A flow of 1,000 cfs ~~will therefore be assumed~~ to correspond to a minimum DO of about 5.0 mg/l. A flow of 500 cfs ~~will be assumed to correspond to a minimum DO of 4.0 mg/l~~ is assumed to correspond to a minimum DO of 4.0 mg/l. A monthly summer flow of 0 cfs is assumed to produce a DO of just 3.0 mg/l.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-18

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

- historical EC data are available for this period.

The following locations in the Delta were selected for assessment of impacts related to Delta salinity conditions:

- Emmaton, one of the locations for Delta agricultural salinity objectives located on the Sacramento River downstream of Decker Island and Threemile Slough;
- Jersey Point, one of the locations for Delta agricultural salinity objectives, and an important location for monitoring effects of salinity intrusion into the central Delta;
- Rock Slough (at Contra Costa Canal), assumed to be representative of CCWD diversions at CCC pumping plant #1, where historical EC and CI measurements are made and where a water quality objective in D-1641 is applied;
- Old River at SR 4, which is near the location of the CCWD pumping plant for the Los Vaqueros Reservoir;
- CCF, which is the location of SWP Banks;
- CVP Tracy, where Delta water is diverted from Old River into the DMC;
- Old River at Tracy Boulevard Bridge, which is a D-1641 water quality objective compliance location and represents water quality in the south Delta channels upstream of the agricultural barriers and tidal gates;
- Grant Line Canal at Tracy Boulevard Bridge, which is not a compliance location for D-1641, but does indicate the water quality of a major south Delta channel; and
- Middle River at Mowry Bridge, which is near the D-1641 compliance location in Old River at the head of Middle River (i.e., Union Island).

Impacts related to DOC were assessed for Delta diversions by CCWD at Rock Slough and near SR 4, and for exports by SWP and CVP. Agricultural diversions are not impacted by DOC concentrations. Impacts related to DO were assessed for the San Joaquin River in the DWSC at the Rough & Ready Island DO monitoring station.

Significance Criteria

The impact significance criteria for water quality variables that have regulatory objectives or numerical standards, such as those contained in the 1995 WQCP, are developed from the following general considerations:

- Numerical water quality objectives have been established to protect beneficial uses, and therefore represent concentrations or values that should not be exceeded (DO concentrations must be above the DO objective); violation of the limits would be significant.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-20

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

- Natural variability caused by tidal flows, river inflows, agricultural drainage, and biological processes in the Delta channels is sometimes quite large relative to the numerical standards or mean values of water quality variables.
- Changes in water quality variables that are greater than natural variations, but are within the limits established by numerical water quality objectives, may cause significant impacts; a criterion for determining significant monthly changes is necessary.
- Monthly changes in a water quality variable that are greater than natural variations, but which occur infrequently enough such that the long-term average value is not raised by more than a specified percentage of the baseline value are considered to be less than significant; a criterion for determining significant long-term changes is necessary.

For variables with numerical water quality criteria, the numerical limits are assumed to adequately protect beneficial uses and provide the basic measure of an allowable limit that will adequately protect beneficial uses. Any increase in the variable that causes the variable to exceed the numerical objective is considered to be a significant impact. No change is allowed if the baseline value exceeds the maximum objective (or if the baseline DO is less than the DO objective). Variables without numerical limits would not have a maximum significance criterion.

Natural variability is difficult to describe with a single value, but it is assumed that 10% of the specified numerical criterion (for variables with numerical criteria) or 10% of the mean value (for variables without numerical criteria) would be a reasonable representation of natural variability that would be expected to occur without causing a significant impact. Appendix D discusses the observed variability in historical Delta salinity (EC) measurements. Simulated monthly changes that are less than 10% of the numerical criterion or less than 10% of the measured or simulated mean value of the variable would not be considered significant water quality impacts because the simulated change would not be greater than natural variability.

A monthly significance criterion is based on the assumption that some changes may be substantial in comparison with natural variability of the water quality variable, and could result in significant impacts. Because the change in water quality that should be considered substantial is not known, judgment must be applied to establish an appropriate significance threshold. Based on professional experience and the measured range of natural variability, the monthly significance criterion has been selected to be 10% of the numerical limits (for variables with numerical limits). It is assumed that this 10% change criterion would prevent relatively large changes that may have potentially significant impacts on beneficial uses. For variable without a numerical limit (e.g., DOC), a monthly change criterion of 10% of the mean value is used as the monthly criterion.

The allowable long-term average increase in a water quality variable that is less than significant is also difficult to determine from purely scientific evidence.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-21

October 2005

J&S 02053.02

locations. The long-term change of 5% of the No Action average EC value applies at all stations.

There are also applicable objectives of 250-mg/l Cl^- concentration at ~~the four~~ three south Delta ~~export~~ locations (CCWD Rock Slough, ~~CCWD Old River~~, SWP Banks, and CVP Tracy). The CCWD at Rock Slough chloride is also subject to a 150-mg/l objective for about half of each calendar year (5 months in critical year, 8 months in wet years). These chloride objectives are considered and the necessary Delta outflow to meet these chloride objectives is calculated within the CALSIM model (e.g., ANN module). These chloride objectives are therefore assumed to be satisfied with the simulated Delta outflow values from the CALSIM model. Chloride concentrations were not simulated with DSM2, and chloride was not evaluated as a salinity variable for the SDIP alternatives. Appendix D contains additional comparisons of chloride and EC values at the CCWD Rock Slough intake.

Criteria for Dissolved Organic Carbon

DOC concentrations in the Delta exhibit relatively large fluctuations (see Figure 5.3-5). Although no numerical water quality objectives have been developed for DOC concentrations, criteria for DOC can be determined from average data on Delta DOC and the estimated effects of DOC concentrations on THM concentrations in treated drinking water. Increases in monthly export DOC of more than 10% of the mean DOC concentration (assumed to be about 4 mg/l), or about 0.4 mg/l, are considered to be significant water quality impacts. Because THM standards involve annual average criteria, the significance criterion for the estimated long-term increase in export DOC concentrations should apply. The average DOC concentrations in the exports should be limited to a change that is small enough to prevent a change in long-term THM concentration of more than 8 $\mu\text{g/l}$ (because 8 $\mu\text{g/l}$ is 10% of the current THM standard of 80 $\mu\text{g/l}$).

A general correlation between DOC concentration and THM concentration suggests that about 10 to 20 $\mu\text{g/l}$ of THM will result from each 1 mg/l of DOC in the raw water supply (State Water Resources Control Board 1995b). Therefore limiting the long-term DOC increases to about 0.4 mg/l would also likely limit the increase in long-term THM to less than 8 $\mu\text{g/l}$. Simulation of THM concentrations in treated water obtained from the Delta was not part of the SDIP impact evaluation because the simulated changes in EC and DOC can be used as surrogates for the potential effects on THM and other disinfection by-products at specific treatment plants using Delta water.

Criteria for Dissolved Oxygen

The minimum DO objectives in the Stockton DWSC are 5 mg/l from December through August and 6 mg/l from September through November (to protect adult migration of Chinook salmon). Any monthly estimated DO concentration less

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

than the applicable objective is considered to be a significant impact. Any reduction in a monthly estimated DO concentration that is more than 10% of the applicable objective (0.5 mg/l reduction) is also considered to be a significant impact.

CALFED Programmatic Mitigation Measures

The maintenance and improvement of Delta water quality are a major purpose for the CALFED Program. There are, however, no programmatic mitigation measures for water quality that will be employed for the SDIP.

Adaptive Operations of South Delta Tidal Gates for Water Quality Improvement

Section 5.2, Delta Tidal Hydraulics, includes a discussion about how tidal gate operations will affect tidal level and tidal flow in the south Delta channels. This section describes the general influences of the tidal gate operations on south Delta salinity (EC) and gives some general water quality guidelines that will be incorporated into the adaptive management operations of the tidal gates. This section presents a description of what controls existing conditions of salinity in south Delta channels (with temporary barriers), and how tidal gate operations can provide beneficial effects for water quality improvement.

Sources of South Delta Salinity

Figure 5.3-9 shows the DSM2-simulated EC for the four sources of water for south Delta channels, and the resulting EC for the CVP and SWP exports for the 2001 baseline conditions, with temporary barriers. The highest EC line in the top graph is the assumed EC for agricultural drainage return flows in the south Delta. These EC values are general estimates based on drainage EC measurements collected by DWR as part of the Municipal Water Quality Investigations. The assumed EC values are highest in winter (about 1,250 $\mu\text{S}/\text{cm}$) during the months of salt leaching and winter storm pumping of drainage. The EC values in the summer are lower (about 750 $\mu\text{S}/\text{cm}$) because the drainage water originates from agricultural diversions that have not contacted the soils for long enough to dissolve much salt. The south Delta water generally contains less than 15% agricultural drainage, so the effects of the drainage EC are relatively small. However, the fraction of agricultural drainage in south Delta channels depends on the agricultural diversions from these channels and the net tidal flows (i.e., tidal flushing) in the south Delta channels.

The water source with the next highest EC value is the San Joaquin River at Vernalis. These CALSIM-estimated Vernalis EC values have been compared to the historical data in Figure 5.3-8. The D-1641 water quality objective at Vernalis is 1,000 $\mu\text{S}/\text{cm}$ during the winter and 700 $\mu\text{S}/\text{cm}$ during the irrigation

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-24

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

1. The CCF intake gates have two somewhat contradictory effects that must be balanced: If the gates are closed during the flood-tide flows prior to the high tide each day, the tidal flushing in south Delta channels can be maximized, and levels at high tide throughout the south Delta channels are preserved. This will allow Tom Paine Slough siphons to operate and provide the maximum tidal flushing upstream of the tidal gates. The CCF intake gates, however, must be opened for a sufficient period each day to maintain the CCF elevations above -2.0 feet msl to prevent pump cavitation problems at SWP Banks, which is often used for maximum off-peak (nighttime) pumping. The CCF priority 3 schedule will be used to achieve this balance.
2. The head of Old River fish control gate can be operated to reduce the San Joaquin River diversions into Old River. This will increase the San Joaquin River flow past Stockton and improve DO conditions in the DWSC. This may be beneficial for adult up-migrating Chinook salmon during the months of September through November. Closure in April and May will reduce the juvenile Chinook that are diverted towards the CVP and SWP pumping plants. However, reduced diversions will cause more water to be drawn from the central Delta to supply the CVP and SWP pumping, which may increase entrainment of some larval or juvenile fish (e.g., delta smelt). Reduction of the head of Old River diversions will also reduce the inflow of higher-salinity San Joaquin River water into the south Delta channels. Partial closure of the head of Old River gate will shift the distribution of San Joaquin River salinity away from the CVP Tracy facility toward the CCWD intakes and the SWP Banks facility.
3. The tidal gates at Grant Line Canal, Old River at DMC, and Middle River can be used to control the water levels in the south Delta channels. In addition, ebb-tide closure of the Old River and Middle River tidal gates can produce a net circulation upstream on Old River and Middle River and downstream in Grant Line Canal. This ebb-tide closure of Old and Middle River tidal gates has been simulated to have a beneficial effect on salinity in these south Delta channels and is the proposed operation for these gates. The ebb-tide closure of the tidal gates is not anticipated to substantially change the fish movement patterns that are triggered by or associated with tidal flows.

The operations of the tidal gates will vary on a day-by-day basis depending on the inflows, export pumping, and water quality and fish conditions measured at Vernalis and in the south Delta. The adaptive management of the south Delta gates will be reviewed and guided by the Gate Operations Review Team (GORT) as described in Chapter 2. The general features of these gate operations have been simulated for each SDIP alternative that are compared to the existing conditions baseline with temporary barriers in the following sections—

—The GORT may not always operate the tidal gates as simulated for the EIS/EIR impact evaluation. Therefore, some of the salinity reductions and increases in the south Delta and DO improvements in the DWSC may not be as great as simulated for the SDIP alternatives. Variations in the future gate operations that may deviate from the simulated gate operations described in the following water

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

quality impact analyses would be controlled by the GORT, after reviewing available tidal flow, water quality, and fish data. It is assumed that the benefits and impacts of these real-time operations would be similar to the effects identified in ~~would be more beneficial for the range of potential effects than the simulated gate operations used for the impact assessment. However, a~~ No new water quality impacts are anticipated for the range of gate operations that ~~would~~ will be likely be directed by the GORT.

Alternative 1 (No Action)

Under the No Action Alternative, the SDIP project components, including dredging activities in Old River, Middle River and West Canal and the operable fish control and tidal gates would not be constructed or operated; diversion and pumping would not increase. SWP and CVP operations would remain the same. There would be no impact on surface water resources from dredging activities or placement, and existing conditions as described above would remain.

The existing conditions baseline does include the seasonal installation of the fish control barrier at the head of Old River and the temporary agricultural barriers in the south Delta channels. These temporary barrier installation and removal activities may result in localized temporary water quality changes, but these are considered to be the existing conditions, and are not identified as impacts.

2020 Conditions

Under Alternative 1 for 2020 conditions, the SDIP project components would not be built or operated; diversion and pumping would not increase. SWP and CVP operations would remain nearly the same. There would be no impact on water quality from dredging activities or placement of the temporary barriers, and existing conditions as described above for 2001 conditions would remain nearly the same.

Alternative 2A

Stage 1 (Physical/Structural Component)

Construction of the tidal gates will influence water quality only temporarily in the south Delta channels. Localized effects during construction and dredging of channels will be minimized with appropriate dredging procedures. The construction impacts may be comparable to those created by the installation and removal of the four temporary barriers each year. Operation of the tidal gates during Stage 1 of Alternative 2A will provide substantial water quality benefits at many south Delta channel locations. The simulated effects on EC are shown for nine selected impact assessment locations.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-28

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Table 5.3-1. DSM2-Simulated Electrical Conductivity Changes for Alternative 2A Stage 1 under 2001
and 2020 Conditions for the 1976–1991 Period

	EC Base Average	EC Alternative Average	EC Change	EC % Change	Number of Increases >10% Base	Average >10% Increase	Number of Increases >100 µS/cm	Average of Increases >100 µS/cm
A. 2001 Conditions								
Emmaton	1,074	1,075	1	0.1	0		0	
Jersey Point	1,079	1,081	2	0.2	0		0	
Rock Slough	532	531	-1	-0.2	0		0	
Old River at SR 4	468	470	2	0.5	1	27	0	
SWP Banks	447	450	4	0.8	2	34	0	
CVP Tracy	530	473	-57	-10.8	6	82	1	121
Old River at Tracy Blvd	595	491	-104	-17.5	11	102	5	147
Middle River at Mowry Bridge	601	445 <u>533</u>	-155 <u>68</u>	-25.7<u>9</u>	85<u>5</u>	57 <u>46</u>	0	
Grant Line Canal at Tracy Boulevard	595	560 <u>48</u>	-35 <u>47</u>	-75.9<u>8</u>	44 <u>10</u>	64 <u>53</u>	0	
B. 2020 Conditions								
Emmaton	1,072	1,073	1	0.1	0		0	
Jersey Point	1,081	1,083	2	0.2	0		0	
Rock Slough	539	538	-1	-0.2	0		0	
Old River at SR 4	469	471	3	0.6	1	25	0	
SWP Banks	446	452	56 <u>102</u> <u>43</u>	102 <u>43</u>	2	343 <u>3</u>	0	
CVP Tracy	526	474 <u>5</u>	-52 <u>1</u>	-9.9 <u>7</u>	8	83 <u>1</u>	21 <u>109</u> <u>10</u>	
Old River at Tracy Blvd	595	493	-102	-17.2	12	117	5	192
Middle River at Mowry Bridge	603	530 <u>29</u>	-72 <u>74</u>	-12.4 <u>3</u>	95 <u>63</u> <u>58</u>	63 <u>58</u>	40 <u>104</u>	
Grant Line Canal at Tracy Boulevard	601	561 <u>50</u>	-51 <u>40</u>	-68.5 <u>6</u>	11	692 <u>2</u>	1	124 <u>16</u>
EC = electrical conductivity (in µS/cm). SR = State Route. µS/cm = microSiemens per centimeter.								

Impact WQ-5: Salinity Changes at Jersey Point. Figure 5.3-13 shows the monthly EC values for Alternative 2A Stage 1 at Jersey Point and the EC values for the 2001 baseline No Action Alternative for 1976–1991 as simulated by DSM2. The bottom graph indicates the changes in EC, with the Alternative 2A Stage 1 EC values plotted against the No Action EC values. The changes in EC were negligible. Table 5.3-1A indicates that the average EC at Jersey Point for the 2001 baseline for the 16-year period simulated with DSM2 was 1,079 µS/cm. The average simulated EC for Alternative 2A Stage 1 was 1,081 µS/cm. No mitigation is required.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-31

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-6: Salinity Changes in Rock Slough. Figure 5.3-14 shows the monthly EC values for Alternative 2A Stage 1 in Rock Slough (at entrance to CCC) and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Simulated Rock Slough EC above the 1,000- $\mu\text{S}/\text{cm}$ objective is not expected because it is assumed that CVP and SWP Delta management operations will maintain the D-1641 salinity objectives. Table 5.3-1A indicates that the average EC at Rock Slough for the 2001 baseline was 532 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2A Stage 1 was 531 $\mu\text{S}/\text{cm}$. No mitigation is required.

Impact WQ-7: Salinity Changes in Old River at State Route 4 Bridge. CCWD constructed the Los Vaqueros intake and pumping plant just upstream of the SR 4 Bridge. Photograph 5.3-11 shows the Los Vaqueros intake, located just upstream (i.e., south) of the SR 4 Bridge on the western bank of Old River. Because the Los Vaqueros intake is several miles upstream from the mouth of Rock Slough, and because it is located directly on Old River, the EC measurements at the Los Vaqueros intake are usually lower than corresponding EC measurements at CCC Pumping Plant #1. Some of the water pumped at the Los Vaqueros intake supplies the CCC through a connecting pipeline. Photograph 5.3-12 shows the Los Vaqueros Reservoir, located southwest of the Los Vaqueros intake. The Los Vaqueros Reservoir provides emergency storage and water quality “blending” water to reduce the CCWD delivered chloride concentrations.

Figure 5.3-15 shows the monthly EC values for Alternative 2A Stage 1 in Old River at the SR 4 Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The bottom graph indicates the changes in EC at CCF, with the Alternative 2A EC values plotted against the No Action EC values. The applicable EC objective of 1,000 $\mu\text{S}/\text{cm}$ is not applied to this intake. The monthly EC change criterion (10% of ~~baseline maximum~~) is therefore ~~100–47 $\mu\text{S}/\text{cm}$~~ . The red line on the graph indicates a 100- $\mu\text{S}/\text{cm}$ increase from the baseline EC value. No months had an EC change of larger than 47 $\mu\text{S}/\text{cm}$.

Table 5.3-1A indicates that the average EC in Old River at the SR 4 Bridge for the 2001 baseline for the 16-year period simulated with DSM2 was 468 $\mu\text{S}/\text{cm}$. This is slightly lower (13%) than the average Rock Slough EC. The average simulated EC for Alternative 2A was 470 $\mu\text{S}/\text{cm}$. The average increase at SR 4 was therefore 2 $\mu\text{S}/\text{cm}$ (0.5% of the baseline average). No mitigation is required.

Impact WQ-8: Salinity Changes at Clifton Court Forebay (SWP Banks Pumping Plant). Photograph 5.3-13 shows SWP Banks, which supplies drinking water to the South Bay Aqueduct and the SWP California Aqueduct.

Figure 5.3-16 shows the monthly EC values for Alternative 2A Stage 1 at CCF, which provides the water for export at SWP Banks, and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-1A indicates that the average EC at CCF for the 2001 baseline

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-32

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

was 447 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2A Stage 1 was 450 $\mu\text{S}/\text{cm}$. The average increase at SWP Banks was therefore about 4 $\mu\text{S}/\text{cm}$ (0.8% of the baseline average). No mitigation is required.

Impact WQ-9: Salinity Changes at CVP Tracy Pumping Plant.

Photograph 5.3-14 shows the intake to the CVP DMC. The DMC supplies drinking water to the City of Tracy and other communities. The CVP Tracy facility is located about 2.5 miles to the south.

Figure 5.3-17 shows the monthly EC values for Alternative 2A Stage 1 at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-1A indicates that the average EC at CVP Tracy for the 2001 baseline was 530 $\mu\text{S}/\text{cm}$. This EC is higher than the average SWP Banks EC because CVP Tracy pumps more of the San Joaquin River water that is diverted down Old River and Grant Line Canal. The average simulated EC for Alternative 2A Stage 1 was 473 $\mu\text{S}/\text{cm}$. The average EC at CVP Tracy was therefore reduced by 57 $\mu\text{S}/\text{cm}$ (10.8% of the baseline average) because of the tidal gate operations that reduced the diversions of San Joaquin River water and provided tidal circulation past the CVP Tracy intake on Old River. Some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. Although there were a few months with simulated increases in the EC values, the overall change is considered a substantial improvement. No mitigation is required.

Impact WQ-10: Salinity Changes in Old River at Tracy Boulevard Bridge

Figure 5.3-18 shows the monthly EC values for Alternative 2A Stage 1 in Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at the Old River at Tracy Boulevard Bridge is 700 $\mu\text{S}/\text{cm}$ from April through August, and 1,000 $\mu\text{S}/\text{cm}$ for the remaining months. The monthly change criterion (10% of objective) is therefore 70 $\mu\text{S}/\text{cm}$ during the irrigation season, and 100 $\mu\text{S}/\text{cm}$ for the remaining months. The bottom graph indicates the changes in EC at Old River at the Tracy Boulevard Bridge, with the Alternative 2A EC values plotted against the No Action EC values. The red line on the graph indicates a 100- $\mu\text{S}/\text{cm}$ increase from the baseline EC value. EC changes of more than 100 $\mu\text{S}/\text{cm}$ will be above the red line. The solid dots indicate months when the EC objective is 700 $\mu\text{S}/\text{cm}$. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 5.3-1A indicates that the average EC at Old River at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. This is higher than the average CVP Tracy EC because the Tracy facility pumps a higher fraction of the Sacramento River water. The average simulated EC for Alternative 2A Stage 1 was 491 $\mu\text{S}/\text{cm}$. The average reduction in EC at Old River at the Tracy Boulevard Bridge was therefore about 104 $\mu\text{S}/\text{cm}$ (17.5% of

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-33

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

the baseline average). This is a substantial improvement in water quality that was achieved by the tidal gate operations. Some of the simulated reduction in EC in Old River at Tracy Boulevard Bridge may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. Although there were some months with simulated increase in the EC values, the overall change is a significant improvement in the baseline EC. No mitigation is required.

Impact WQ-11: Salinity Changes in Grant Line Canal at Tracy Boulevard Bridge. Figure 5.3-19 shows the monthly EC values for Alternative 2A Stage 1 in Grant Line Canal at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. There is no applicable EC objective at Grant Line Canal at the Tracy Boulevard Bridge. Grant Line EC values are evaluated to represent this important south Delta channel. Table 5.3-1A indicates that the average EC at Grant Line Canal at the Tracy Boulevard Bridge for the 2001 baseline was 595 $\mu\text{S}/\text{cm}$. This is identical to the average EC at Old River at Tracy Boulevard Bridge. The average simulated EC for Alternative 2A Stage 1 was 560 $\mu\text{S}/\text{cm}$. The average reduction was therefore 35 $\mu\text{S}/\text{cm}$ (5.9% of the baseline average). Although there were some months with an increase in EC values, this was a substantial improvement in water quality achieved with the tidal gate operations. No mitigation is required.

Impact WQ-12: Salinity Changes in Middle River at Mowry Bridge. Figure 5.3-20 shows the monthly EC values for Alternative 2A Stage 1 at Middle River at the Mowry Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at Middle River at the Mowry Bridge is 700 $\mu\text{S}/\text{cm}$ during the April–August irrigation season, and 1,000 $\mu\text{S}/\text{cm}$ for the remaining months. Table 5.3-1A indicates that the average EC at Middle River at the Mowry Bridge for the 2001 baseline was 601 $\mu\text{S}/\text{cm}$. This is the highest EC value of any of the south Delta channels upstream of the barriers, because the Middle River at Mowry Bridge salinity has the greatest contribution from the San Joaquin River. The average simulated EC for Alternative 2A Stage 1 was 445 $\mu\text{S}/\text{cm}$. The average reduction was therefore 155 $\mu\text{S}/\text{cm}$ (25.9% of the baseline average). This very large reduction was the result of tidal gate operations that provided flushing of Middle River water upstream of Victoria Canal. Although there were some months with an EC increase, this was a substantial improvement in water quality achieved with the tidal gate operations. No mitigation is required.

Impact WQ-13: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations. Figure 5.3-21 shows the San Joaquin River at Stockton flows simulated by DSM2 for the 2001 baseline conditions and Alternative 2A Stage 1. Only flows of less than 1,500 cfs are assumed to have an effect on the DWSC DO concentrations for this impact assessment. ~~(Central Valley Regional Water Quality Control Board 2003).~~ Because the simulated operation of the head of Old River fish control gate assumed complete closure of

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-34

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

the gate in April and May, the San Joaquin River Stockton flows were increased substantially during these months. A constant diversion flow of 500 cfs was simulated in the months of June–September, so the simulated Stockton flow was increased in many of these months. During some of the summer months, the 500 cfs assumed for the Old River diversion was greater than the simulated diversion under existing conditions. Therefore, slightly reduced flow at Stockton was simulated in several months compared to the existing conditions. It is important to note that actual operations of the head of Old River gate during Stage 1 could only reduce the diversions into Old River, and could only increase the flows at Stockton. Therefore, the simulated reductions in Stockton flow that produced a slight reduction in estimated DO concentrations were ignored in the assessment of DO impacts.

The bottom graph of Figure 5.3-21 indicates the relationship between CVP and SWP pumping and the fraction of the San Joaquin River that continues past the head of Old River to Stockton. At relatively low export pumping (as a fraction of San Joaquin River flow at Mossdale), the fraction of the San Joaquin River flow that continues past Stockton is about 50%. As pumping increases, the fraction of the flow continuing past Stockton decreases. Under the 2001 baseline, which includes some months with temporary agricultural barriers, the fraction of the flow continuing past Stockton is increased to about 75% of the Vernalis flow, but this fraction decreases with increasing export pumping. For Alternative 2A Stage 1, there are two months when the head of Old River fish control gate is assumed to be completely closed and exports are low to implement the VAMP. In many other months, the flow at Stockton was increased by the head of Old River tidal gate operations.

Figure 5.3-22 shows that the estimated effect of DSM2-simulated flows with Alternative 2A Stage 1 was to increase the Stockton DWSC DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). During most of these months, the simulated flows at Stockton are increased and the DO estimates are increased. There are some months when the simulated flows at Stockton were reduced (by the 500 cfs assumed Old River diversion) and the estimated DO concentrations were reduced. This would be identified as a significant DO impact, except that this reduction in flow cannot actually occur under Stage 1 operations of the head of Old River gate. Table 5.3-2 gives the June–October average estimated DO concentrations in the DWSC for 1976–1991. The average baseline DO in these months was 4.87 mg/l, and the estimated DO for Alternative 2A Stage 1 was increased to 5.03 mg/l. This is an improvement in the simulated flow and DO conditions at Stockton that resulted from the head of Old River tidal gate operations. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operation selected by the GORT.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-35

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

average EC at Rock Slough for the 2001 baseline was 532 $\mu\text{S}/\text{cm}$. This is only about half of the average EC at Jersey Point. The average simulated EC for Alternative 2A Stage 2 was 539 $\mu\text{S}/\text{cm}$. The average increase at Rock Slough was therefore about 7 $\mu\text{S}/\text{cm}$ (1.3% of the baseline average). Because this long-term increase is less than 5% of the baseline average, the overall change in salinity is considered to be less than significant. No mitigation is required.

Impact WQ-17: Salinity Changes in Old River at State Route 4 Bridge Resulting from Stage 2. CCWD in cooperation with CBDA Drinking Water Program is reducing the influence of treated wastewater and agricultural drainage from Byron Tract near the CCWD Old River intake. These improvements in salinity are not included in the DSM2 modeling results used to evaluate SDIP salinity impacts. Figure 5.3-26 shows the monthly EC values for Alternative 2A Stage 2 in Old River at the SR 4 Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2.

Table 5.3-3A indicates that the average EC at Old River at the SR 4 Bridge for the 2001 baseline for the 16-year period simulated with DSM2 was 468 $\mu\text{S}/\text{cm}$. This is slightly lower (13%) than the average Rock Slough EC. The average simulated EC for Alternative 2A Stage 2 was 478 $\mu\text{S}/\text{cm}$. The average increase at SR 4 was therefore about 10 $\mu\text{S}/\text{cm}$ (2.1% of the baseline average). Because this long-term increase is less than 5% of the baseline average, the overall change in salinity is considered to be less than significant. The monthly EC change criteria at SR 4 is 47 $\mu\text{S}/\text{cm}$ (10% baseline). At SR 4, there were ~~just~~ 27 months with an EC change of more than ~~100–47~~ $\mu\text{S}/\text{cm}$. Although these relatively large monthly changes could occur under the Alternative 2A Stage 2 operations, the overall EC change is small enough to avoid any reductions in beneficial uses and the simulated changes at Old River at the SR 4 Bridge are considered to be less than significant. No mitigation is required.

Impact WQ-18: Salinity Changes at Clifton Court Forebay (SWP Banks Pumping Plant) Resulting from Stage 2. Figure 5.3-27 shows the monthly EC values for Alternative 2A Stage 2 at CCF, which provides the water for export at SWP Banks, and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at SWP Banks is 1,000 $\mu\text{S}/\text{cm}$. The monthly change criterion (10% of maximum) is therefore 100 $\mu\text{S}/\text{cm}$. Table 5.3-3A indicates that the average EC at CCF for the 2001 baseline was 447 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2A Stage 2 was 457 $\mu\text{S}/\text{cm}$. The average increase at SWP Banks was therefore about 10 $\mu\text{S}/\text{cm}$ (2.2% of the baseline average). Because this long-term increase is less than 5% of the baseline average, the overall change in salinity is considered to be less than significant. No mitigation is required.

Impact WQ-19: Salinity Changes at CVP Tracy Pumping Plant Resulting from Stage 2. Figure 5.3-28 shows the monthly EC values for Alternative 2A Stage 2 at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at CVP Tracy is 1,000 $\mu\text{S}/\text{cm}$. The monthly change

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-40

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

criterion (10% of maximum) is therefore 100 $\mu\text{S}/\text{cm}$. Table 5.3-3A indicates that the average EC at CVP Tracy for the 2001 baseline was 530 $\mu\text{S}/\text{cm}$. This EC is higher than the average SWP Banks EC because CVP Tracy pumps more of the San Joaquin River water that is diverted down Old River and Grant Line Canal. The average simulated EC for Alternative 2A Stage 2 was 479 $\mu\text{S}/\text{cm}$. The average reduction at CVP Tracy was therefore about 52 $\mu\text{S}/\text{cm}$ (9.7% of the baseline average). This is a substantial improvement in EC values that results from the tidal gate operations. Some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. The additional pumping under Alternative 2A Stage 2 did not substantially increase the simulated EC values at CVP Tracy that were achieved with Stage 1. No mitigation is required.

Impact WQ-20: Salinity Changes in Old River at Tracy Boulevard Bridge Resulting from Stage 2. Figure 5.3-29 shows the monthly EC values for Alternative 2A Stage 2 in Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at the Old River at Tracy Boulevard Bridge is 700 $\mu\text{S}/\text{cm}$ from April through August, and 1,000 $\mu\text{S}/\text{cm}$ for the remaining months. The monthly change criterion (10% of objective) is therefore 70 $\mu\text{S}/\text{cm}$ during the irrigation season and 100 $\mu\text{S}/\text{cm}$ for the remaining months. The bottom graph indicates the changes in EC at Old River at the Tracy Boulevard Bridge, with the Alternative 2A EC values plotted against the No Action EC values. The red line on the graph indicates a 100- $\mu\text{S}/\text{cm}$ increase from the baseline EC value. The solid dots indicate months when the EC objective is 700 $\mu\text{S}/\text{cm}$. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 5.3-3A indicates that the average EC at Old River at the Tracy Boulevard Bridge for the 2001 baseline was 595 $\mu\text{S}/\text{cm}$. This is higher than the average CVP Tracy EC because the Tracy facility pumps a higher fraction of the Sacramento River water. The average simulated EC for Alternative 2A Stage 2 was 495 $\mu\text{S}/\text{cm}$. The average reduction in EC in Old River at the Tracy Boulevard Bridge was therefore about 99 $\mu\text{S}/\text{cm}$ (16.7% of the baseline average). This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required. It should be noted that ~~some of the simulated reduction in EC in Old River at Tracy Boulevard Bridge may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT.~~ This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-21: Salinity Changes in Grant Line Canal at Tracy Boulevard Bridge Resulting from Stage 2. Figure 5.3-30 shows the monthly EC values for Alternative 2A Stage 2 in Grant Line Canal at the Tracy

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-26: Increases in Dissolved Organic Carbon at CVP Tracy Pumping Plant Resulting from Stage 2. Figure 5.3-40 shows the monthly DOC concentrations at CVP Tracy for Alternative 2A Stage 2 compared with the 2001 baseline DOC concentrations. Three of the monthly increases were greater than the 0.4-mg/l maximum change criterion. Table 5.3-4 indicates that the overall average DOC concentrations for the 1976–1991 period was 3.71 mg/l for the baseline and was 3.68 mg/l for Alternative 2A Stage 2. Therefore, the DOC impacts at CVP Tracy are less than significant. No mitigation is required.

Although none of the simulated DOC concentrations for the other SDIP alternatives are shown graphically in this section, the simulations indicate that there are no significant DOC impacts at any of the water supply intakes for any of the SDIP operational scenarios. The changes in pumping and channel flows are not large enough to make a substantial difference in the agricultural drainage contributions, so the corresponding DOC concentrations are not significantly changed from the 2001 existing conditions baseline or from the 2020 future no action baseline.

Impact WQ-27: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations Resulting from Stage 2. Figure 5.3-41 shows that the estimated effect of Alternative 2A Stage 2 DSM2-simulated flows on the Stockton DWSC DO was to increase the DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). There are some months when the estimated DO concentrations were reduced because the simulated flows at Stockton were reduced (by the 500 cfs assumed for the Old River diversion). This would be identified as a significant DO impact, except that this reduction in flow would not actually occur under Stage 2 operations of the head of Old River gate. Gate operations will reduce the Old River diversions that would have occurred under existing conditions. The possible effects of increased pumping on the head of Old River diversions will be controlled with the gate to provide increased flows at Stockton. Table 5.3-2 gives the June–October average estimated DO concentrations in the DWSC for 1976–1991. The average baseline DO in these months was 4.87 mg/l, and the estimated DO for Alternative 2A Stage 2 was 5.03 mg/l. This is a substantial improvement in the simulated flow and DO conditions at Stockton that is the result of the head of Old River tidal gate operations. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operation selected by the GORT.

2020 Conditions

The water quality effects for Alternative 2A Stage 2 under 2020 conditions are generally the same as the impacts and mitigation measures described above for Alternative 2A under 2001 conditions. DSM2-simulated EC values for Alternative 2A Stage 2 under 2020 conditions are presented in Tables 5.3-3B.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-45

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-17: Salinity Changes in Old River at State Route 4 Bridge Resulting from Stage 2.

Figure 5.3-43 shows the monthly EC values for Alternative 2B at Old River at the SR 4 Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-5A indicates that the average EC at Old River at the SR 4 Bridge for the 2001 baseline No Action Alternative for the 16-year period simulated with DSM2 was 468 $\mu\text{S}/\text{cm}$. The monthly EC change criteria is 47 $\mu\text{S}/\text{cm}$ (10% baseline); 14 months had an EC change of greater than 47 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was 478 $\mu\text{S}/\text{cm}$. The average increase at SR 4 was therefore about 10 $\mu\text{S}/\text{cm}$ (2.1% of the baseline average). No mitigation is required.

Impact WQ-18: Salinity Changes at Clifton Court Forebay (SWP Banks Pumping Plant) Resulting from Stage 2.

Figure 5.3-44 shows the monthly EC values for Alternative 2B at CCF, which provides the water for export at SWP Banks, and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-5A indicates that the average EC at CCF for the 2001 baseline No Action Alternative was 447 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was 457 $\mu\text{S}/\text{cm}$. The average increase at SWP Banks was therefore about 11 $\mu\text{S}/\text{cm}$ (2.3% of the baseline average). No mitigation is required.

Impact WQ-19: Salinity Changes at CVP Tracy Pumping Plant Resulting from Stage 2.

Figure 5.3-45 shows the monthly EC values for Alternative 2B at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-5A indicates that the average EC at CVP Tracy for the 2001 baseline No Action Alternative was 530 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was 479 $\mu\text{S}/\text{cm}$. The average reduction at CVP Tracy was therefore about 51 $\mu\text{S}/\text{cm}$ (9.6% of the baseline average). This is a substantial improvement in EC values that results from the tidal gate operations. No mitigation is required. It should be noted that some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. This is a substantial improvement in EC values that results from the tidal gate operations. No mitigation is required.

Impact WQ-20: Salinity Changes in Old River at Tracy Boulevard Bridge Resulting from Stage 2.

Figure 5.3-46 shows the monthly EC values for Alternative 2B in Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The applicable EC objective at the Old River at Tracy Boulevard Bridge is 700 $\mu\text{S}/\text{cm}$ during the April–August irrigation season and 1,000 $\mu\text{S}/\text{cm}$ in the remainder of the months. The monthly change criterion (10% of maximum) is therefore 70 $\mu\text{S}/\text{cm}$ during the irrigation season and 100 $\mu\text{S}/\text{cm}$ in the remaining months. The bottom graph indicates the changes in EC in Old River at the Tracy Boulevard Bridge, with the Alternative 2B EC

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-48

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

values plotted against the No Action EC values. The solid dots indicate months when the EC objective is 700 $\mu\text{S}/\text{cm}$. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 5.3-4 indicates that the average EC at Old River at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was 496 $\mu\text{S}/\text{cm}$. The average reduction in Old River at the Tracy Boulevard Bridge was therefore about 99 $\mu\text{S}/\text{cm}$ (16.6% of the baseline average). This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required. It should be noted that some of the simulated reduction in EC in Old River at Tracy Boulevard Bridge may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-21: Salinity Changes in Grant Line Canal at Tracy Boulevard Bridge Resulting from Stage 2. Figure 5.3-47 shows the monthly EC values for Alternative 2B in Grant Line Canal at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-5A indicates that the average EC in Grant Line Canal at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was 550 $\mu\text{S}/\text{cm}$. The average reduction in Grant Line Canal at the Tracy Boulevard Bridge was 45 $\mu\text{S}/\text{cm}$ (7.6% of baseline). No mitigation is required.

Impact WQ-22: Salinity Change in Middle River at Mowry Bridge Resulting from Stage 2. Figure 5.3-48 shows the monthly EC values for Alternative 2B in Middle River at the Mowry Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2.

Table 5.3-5A indicates that the average EC at Middle River at the Mowry Bridge for the 2001 baseline No Action Alternative was 601 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2B was reduced to 436 $\mu\text{S}/\text{cm}$. The average reduction in Middle River at the Mowry Bridge was therefore 165 $\mu\text{S}/\text{cm}$ (27.5% of the baseline average). This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impacts WQ-23 to WQ-26: Increases in Dissolved Organic Carbon at Water Supply Intakes Resulting from Stage 2. The DSM2-simulated changes in DOC for Alternative 2B are nearly identical to the simulated changes for Alternative 2A. The simulated DOC values for Alternative 2B are given in Table 5.3-6. The simulated DOC changes for Alternative 2B are less than significant. No mitigation is required.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-49

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-27: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations Resulting from Stage 2. The monthly average San Joaquin River flows at Stockton simulated by DSM2 for Alternative 2B are nearly identical to those simulated for Alternative 2A because the simulated gate operations are the same for these alternatives. The estimated effects on DO of Alternative 2B are therefore nearly identical to those estimated for Alternative 2A.

Figure 5.3-49 shows that the estimated effect of Alternative 2B simulated flows on the Stockton DWSC DO was to increase the DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). There are some months when the estimated DO concentrations were reduced because the simulated flows at Stockton were reduced (by the 500 cfs assumed Old River diversion). This would be identified as a significant DO impact, except that this reduction in flow would not actually occur under Stage 2 operations of the head of Old River gate. Gate operations will reduce the Old River diversions that would have occurred under existing conditions. The possible effects of increased pumping on the head of Old River diversions will be controlled with the gate to provide increased flows at Stockton. The calculated DO impacts are summarized in Table 5.3-2 for Alternative 2B. The average DO for the June–October period for Alternative 2B was 5.03 mg/l, an average of 0.16 mg/l more than the 2001 baseline average DO value for these months. This is a benefit for DO concentrations in the DWSC that resulted from the head of Old River tidal gate operations. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operation selected by the GORT.

2020 Conditions

The water quality benefits for Alternative 2B Stage 2 under 2020 conditions are assumed to be the same as the benefits described above for Alternative 2B Stage 2 under 2001 conditions. DSM2-simulated EC values for Alternative 2B Stage 2 under 2020 conditions are presented in Table 5.3-5B.

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

the average EC at Rock Slough for the 2001 baseline No Action Alternative was 532 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 543 $\mu\text{S}/\text{cm}$. The average increase at Rock Slough was therefore about 11 $\mu\text{S}/\text{cm}$ (2.1% of the baseline average). This impact is less than significant. No mitigation is required.

Impact WQ-17: Salinity Changes in Old River at State Route 4 Bridge Resulting from Stage 2. Figure 5.3-51 shows the monthly EC values for Alternative 2C in Old River at the SR 4 Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at Old River at the SR 4 Bridge for the 2001 baseline No Action Alternative for the 16-year period simulated with DSM2 was 468 $\mu\text{S}/\text{cm}$. The monthly EC change criteria is 47 $\mu\text{S}/\text{cm}$ (10% baseline); 17 months had an EC change of greater than 47 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 480 $\mu\text{S}/\text{cm}$. The average increase at the SR 4 Bridge was therefore about 12 $\mu\text{S}/\text{cm}$ (2.6% of the baseline average). This impact is less than significant. No mitigation is required.

Impact WQ-18: Salinity Changes at Clifton Court Forebay (SWP Banks Pumping Plant) Resulting from Stage 2. Figure 5.3-52 shows the monthly EC values for Alternative 2C at CCF and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at CCF for the 2001 baseline No Action Alternative was 447 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 459 $\mu\text{S}/\text{cm}$. The average increase at SWP Banks was therefore about 12 $\mu\text{S}/\text{cm}$ (2.7% of the baseline average). This impact is less than significant. No mitigation is required.

Impact WQ-19: Salinity Changes at CVP Tracy Pumping Plant Resulting from Stage 2. Figure 5.3-53 shows the monthly EC values for Alternative 2C at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at CVP Tracy for the 2001 baseline No Action Alternative was 530 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 482 $\mu\text{S}/\text{cm}$. The average reduction at CVP Tracy was therefore about 49 $\mu\text{S}/\text{cm}$ (9.2% of the baseline average). This is a substantial improvement in EC values that results from the tidal gate operations. No mitigation is required. It should be noted that some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT. This is a substantial improvement in EC values that results from the tidal gate operations. No mitigation is required.

Impact WQ-20: Salinity Changes in Old River at Tracy Boulevard Bridge Resulting from Stage 2. Figure 5.3-54 shows the monthly EC values for Alternative 2C in Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at Old

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-53

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

River at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 498 $\mu\text{S}/\text{cm}$. The average reduction in Old River at the Tracy Boulevard Bridge was therefore about 96 $\mu\text{S}/\text{cm}$ (16.2% of the baseline average). This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required. It should be noted that ~~some of the simulated reduction in EC in Old River at Tracy Boulevard Bridge may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the full closure during April and May, and the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operations selected by the GORT.~~ This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-21: Salinity Changes in Grant Line Canal at Tracy Boulevard Bridge Resulting from Stage 2. Figure 5.3-55 shows the monthly EC values for Alternative 2C in Grant Line Canal at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at Grant Line Canal at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was 550 $\mu\text{S}/\text{cm}$. This is a substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-22: Salinity Change in Middle River at Mowry Bridge Resulting from Stage 2. Figure 5.3-56 shows the monthly EC values for Alternative 2C at Middle River at the Mowry Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-7A indicates that the average EC at Middle River at the Mowry Bridge for the 2001 baseline No Action Alternative was 601 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 2C was reduced to 436 $\mu\text{S}/\text{cm}$. This is a very substantial improvement in EC that was achieved with tidal gate operations. No mitigation is required.

Impacts WQ-23 to WQ-26: Increases in Dissolved Organic Carbon at Water Supply Intakes Resulting from Stage 2. The DSM2-simulated changes in DOC for Alternative 2C are nearly identical to the simulated changes for Alternative 2A. The simulated DOC values for Alternative 2C are given in Table 5.3-8. The simulated DOC changes for Alternative 2C are less than significant. No mitigation is required.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-54

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Table 5.3-8. DSM2-Simulated Dissolved Organic Carbon Values for Alternative 2C under 2001
Conditions for the 1976–1991 Period

	DOC Base Average	DOC Alternative Average	DOC Change	DOC % Change	Number of Changes >0.4 mg/l	Average Change >0.4 mg/l
2001						
Rock Slough	3.37	3.34	-0.03	-0.9	1	0.74
Old River at State Route 4	3.73	3.78	0.05	1.3	13	0.64
CVP Tracy Pumping Plant	3.71	3.68	-0.04	-1.0	2	0.70
SWP Banks Pumping Plant	3.80	3.78	-0.02	-0.4	2	0.52

DOC = dissolved organic carbon.
mg/l = milligrams per liter.

Impact WQ-27: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations Resulting from Stage 2. The monthly average San Joaquin River flows at Stockton simulated by DSM2 for Alternative 2C are nearly identical to those simulated for Alternative 2A because the simulated gate operations are the same for these alternatives. The estimated effects on DO of Alternative 2C are therefore nearly identical to those estimated for Alternative 2A.

Figure 5.3-57 shows that the estimated effect of Alternative 2C DSM2-simulated Stockton flows on the Stockton DWSC DO was to increase the DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). There are some months when the estimated DO concentrations were reduced because the simulated flows at Stockton were reduced (by the 500 cfs assumed Old River diversion). This would be identified as a significant DO impact, except that this reduction in flow would not actually occur under Stage 2 operations of the head of Old River gate. Gate operations will reduce the Old River diversions that would have occurred under existing conditions. The possible effects of increased pumping on the head of Old River diversions will be controlled with the gate to provide increased flows at Stockton. Table 5.3-2 indicates that the average calculated DO for Alternative 2C was about 0.16 more than the 2001 baseline value. This is a benefit for DO concentrations in the DWSC that resulted from the head of Old River tidal gate operations. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated. In particular, the partial closure to limit the head of Old River diversion to 500 cfs during the summer months may not be the gate operation selected by the GORT.

2020 Conditions

The water quality benefits for Alternative 2C under 2020 conditions are assumed to be the same as the benefits described above for Alternative 2C under 2001 conditions. DSM2-simulated EC values for Alternative 2C under 2020 conditions are presented in Table 5.3-7B.

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-19: Salinity Changes at CVP Tracy Pumping Plant

Resulting from Stage 2. Figure 5.3-59 shows the monthly EC values for Alternative 3B Stage 2 at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-9A indicates that the average EC at CVP Tracy for the 2001 baseline No Action Alternative was 530 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 3B Stage 2 was reduced to 480 $\mu\text{S}/\text{cm}$. The average decrease at CVP Tracy was therefore about 50 $\mu\text{S}/\text{cm}$ (9.5% below the baseline average). Some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. Because this long-term average EC is reduced compared to the baseline, this is a significant benefit for water quality that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-20: Salinity Changes in Old River at Tracy Boulevard

Bridge Resulting from Stage 2. Figure 5.3-60 shows the monthly EC values for Alternative 3B Stage 2 in Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The solid dots indicate months when the EC objective is 700 $\mu\text{S}/\text{cm}$. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 5.3-9A indicates that the average EC at Old River at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 3B was reduced to 496 $\mu\text{S}/\text{cm}$. The average decrease in Old River at the Tracy Boulevard Bridge was therefore about 99 $\mu\text{S}/\text{cm}$ (16.7% below the baseline average). Some of the simulated reduction in EC in Old River at Tracy Boulevard Bridge may not occur if the head of Old River tidal gate is not operated as simulated. Because this long-term average EC is reduced substantially compared to the baseline, there is a significant water quality benefit that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-21: Salinity Changes in Grant Line Canal at Tracy

Boulevard Bridge Resulting from Stage 2. Figure 5.3-61 shows the monthly EC values for Alternative 3B Stage 2 in Grant Line Canal at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-9A indicates that the average EC in Grant Line Canal at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 3B Stage 2 was 541 $\mu\text{S}/\text{cm}$. The average reduction in Grant Line Canal at Tracy Boulevard Bridge was therefore about 54 $\mu\text{S}/\text{cm}$ (9.1% of the baseline average). Because this long-term reduction is more than 5% of the baseline average, the simulated changes at Grant Line Canal at Tracy Boulevard Bridge are considered to be a significant water quality benefit that was achieved with tidal gate operations. No mitigation is required.

Impact WQ-22: Salinity Changes in Middle River at Mowry Bridge

Resulting from Stage 2. Figure 5.3-62 shows the monthly EC values for

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-58

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Alternative 3B Stage 2 in Middle River at the Mowry Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-9A indicates that the average EC at Middle River at the Mowry Bridge for the 2001 baseline No Action Alternative was 601 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 3B was reduced to 430 $\mu\text{S}/\text{cm}$. The average decrease at Middle River at the Mowry Bridge was therefore 171 $\mu\text{S}/\text{cm}$ (28.4% below the baseline average). This is a substantial water quality benefit that was achieved with tidal gate operations. No mitigation is required.

Impacts WQ-23 to WQ-26: Increases in Dissolved Organic Carbon at Water Supply Intakes Resulting from Stage 2. The DOC concentrations were not simulated with DSM2 for Alternative 3B, because DOC is not expected to substantially change with south Delta tidal gate operations. The DOC impacts would be similar to those simulated for Alternative 2B. The expected DOC changes for Alternative 3B are less than significant. No mitigation is required.

Impact WQ-27: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations Resulting from Stage 2. The monthly average San Joaquin River flows at Stockton simulated by DSM2 for Alternative 3B are similar to those simulated for the other SDIP alternatives, because the simulated head of Old River fish control gate operations are the same for all of these alternatives.

Figure 5.3-63 shows that the estimated effect of Alternative 3B simulated Stockton flows on the Stockton DWSC DO was to increase the DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). There are some months when the estimated DO concentrations were reduced because the simulated flows at Stockton were reduced (by the 500 cfs assumed Old River diversion). This would be identified as a significant DO impact, except that this reduction in flow would not actually occur under Stage 2 operations of the head of Old River gate. Gate operations will reduce the Old River diversions that would have occurred under existing conditions. The possible effects of increased pumping on the head of Old River diversions will be controlled with the gate to provide increased flows at Stockton. Table 5.3-2 gives the calculated changes in DO for Alternative 3B Stage 2. The average DO was increased by 0.13 mg/l with Alternative 3B. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated.

2020 Conditions

The water quality benefits for Alternative 3B under 2020 conditions are assumed to be the same as the benefits described above for Alternative 3B under 2001 conditions. DSM2-simulated EC values for Alternative 3B under 2020 conditions are presented in Table 5.3-9B.

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-59

October 2005

J&S 02053.02

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

Impact WQ-19: Salinity Changes at CVP Tracy Pumping Plant

Resulting from Stage 2. Figure 5.3-65 shows the monthly EC values for Alternative 4B Stage 2 at CVP Tracy and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-10A indicates that the average EC at CVP Tracy for the 2001 baseline No Action Alternative was 530 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 4B Stage 2 was reduced to 508 $\mu\text{S}/\text{cm}$. The average decrease at CVP Tracy was therefore about 22 $\mu\text{S}/\text{cm}$ (4.2% below the baseline average). Some of the simulated reduction in EC at the CVP Tracy Pumping Plant may not occur if the head of Old River tidal gate is not operated as simulated. Because this long-term average EC is reduced compared to the baseline, there is a small water quality benefit. No mitigation is required.

Impact WQ-20: Salinity Changes in Old River at Tracy Boulevard Bridge Resulting from Stage 2.

Figure 5.3-66 shows the monthly EC values for Alternative 4B Stage 2 at Old River at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. The solid dots indicate months when the EC objective is 700 $\mu\text{S}/\text{cm}$. A change that is slightly below the red line would indicate a significant monthly change in these months.

Table 5.3-10A indicates that the average EC at Old River at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 4B was 621 $\mu\text{S}/\text{cm}$. The average increase at Old River at the Tracy Boulevard Bridge was therefore about 27 $\mu\text{S}/\text{cm}$ (4.5% of the baseline average). Some of the simulated increases in EC in Old River at Tracy Boulevard Bridge may be greater if the head of Old River tidal gate is not operated as simulated. Because this long-term increase is about 5% of the baseline average, the overall change is considered to be a significant impact on baseline EC. However, several of the largest EC changes were during months when the assumed Vernalis EC (simulated by CALSIM) was greater than the EC objectives. It is unlikely that these high Vernalis EC values are correct. Furthermore, the simulated operations of the head of Old River gate could potentially be changed to allow less San Joaquin River flow into the south Delta channels. Adaptive management of the gate operations is expected to reduce this simulated impact to less than significant. No further mitigation is expected to be required.

Impact WQ-21: Salinity Change in Grant Line Canal at Tracy

Boulevard Bridge Resulting from Stage 2. Figure 5.3-67 shows the monthly EC values for Alternative 4B Stage 2 at Grant Line Canal at the Tracy Boulevard Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-10A indicates that the average EC in Grant Line Canal at the Tracy Boulevard Bridge for the 2001 baseline No Action Alternative was 595 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 4B Stage 2 was reduced to 581 $\mu\text{S}/\text{cm}$. The average decrease in Grant Line Canal at the Tracy Boulevard Bridge was therefore about 14 $\mu\text{S}/\text{cm}$ (2.4% below the baseline average). Because this long-term average EC is

U.S. Department of the Interior, Bureau of Reclamation,
and the California Department of Water Resources

Water Quality

reduced compared to the baseline, there is a small water quality benefit. No mitigation is required.

Impact WQ-22: Salinity Change in Middle River at Mowry Bridge Resulting from Stage 2. Figure 5.3-68 shows the monthly EC values for Alternative 4B Stage 2 in Middle River at the Mowry Bridge and the changes from the monthly EC values for the No Action Alternative for 1976–1991 as simulated by DSM2. Table 5.3-10A indicates that the average EC in Middle River at the Mowry Bridge for the 2001 baseline No Action Alternative was 601 $\mu\text{S}/\text{cm}$. The average simulated EC for Alternative 4B Stage 2 was reduced to 544 $\mu\text{S}/\text{cm}$. The average decrease at Middle River at the Mowry Bridge was therefore 56 $\mu\text{S}/\text{cm}$ (9.4% below the baseline average). This is a significant water quality benefit resulting from the head of Old River tidal gate operation. No mitigation is required.

Impacts WQ-23 to WQ-26: Increases in Dissolved Organic Carbon at Water Supply Intakes Resulting from Stage 2. The DOC concentrations were not simulated with DSM2 for Alternative 4B, because DOC is not expected to change with south Delta tidal gate operations. The DOC impacts would be similar to those simulated for Alternative 2B. The expected DOC changes for Alternative 4B are less than significant. No mitigation is required.

Impact WQ-27: Changes in Stockton Deep Water Ship Channel Dissolved Oxygen Concentrations Resulting from Stage 2. The monthly average San Joaquin River flows at Stockton simulated by DSM2 for Alternative 4B are nearly identical to those simulated for Alternative 2B because the simulated head of Old River fish control gate operations are the same for these alternatives. The estimated effects on DO of Alternative 4B are therefore nearly identical to those estimated for Alternative 2B.

Figure 5.3-69 shows that the estimated effect of Alternative 4B simulated Stockton flows on the Stockton DWSC DO was to increase the DO by as much as 1 mg/l (equivalent to a flow increase of 500 cfs). There are some months when the estimated DO concentrations were reduced because the simulated flows at Stockton were reduced (by the 500 cfs assumed Old River diversion). This would be identified as a significant DO impact, except that this reduction in flow would not actually occur under Stage 2 operations of the head of Old River gate. Gate operations will reduce the Old River diversions that would have occurred under existing conditions. The possible effects of increased pumping on the head of Old River diversions will be controlled with the gate to provide increased flows at Stockton. Table 5.3-2 indicates that the average DO was increased by 0.13 mg/l with Alternative 4B. No mitigation is required. Some of the simulated increases in DO concentrations caused by increased flows may not occur if the head of Old River tidal gate is not operated as simulated.

2020 Conditions

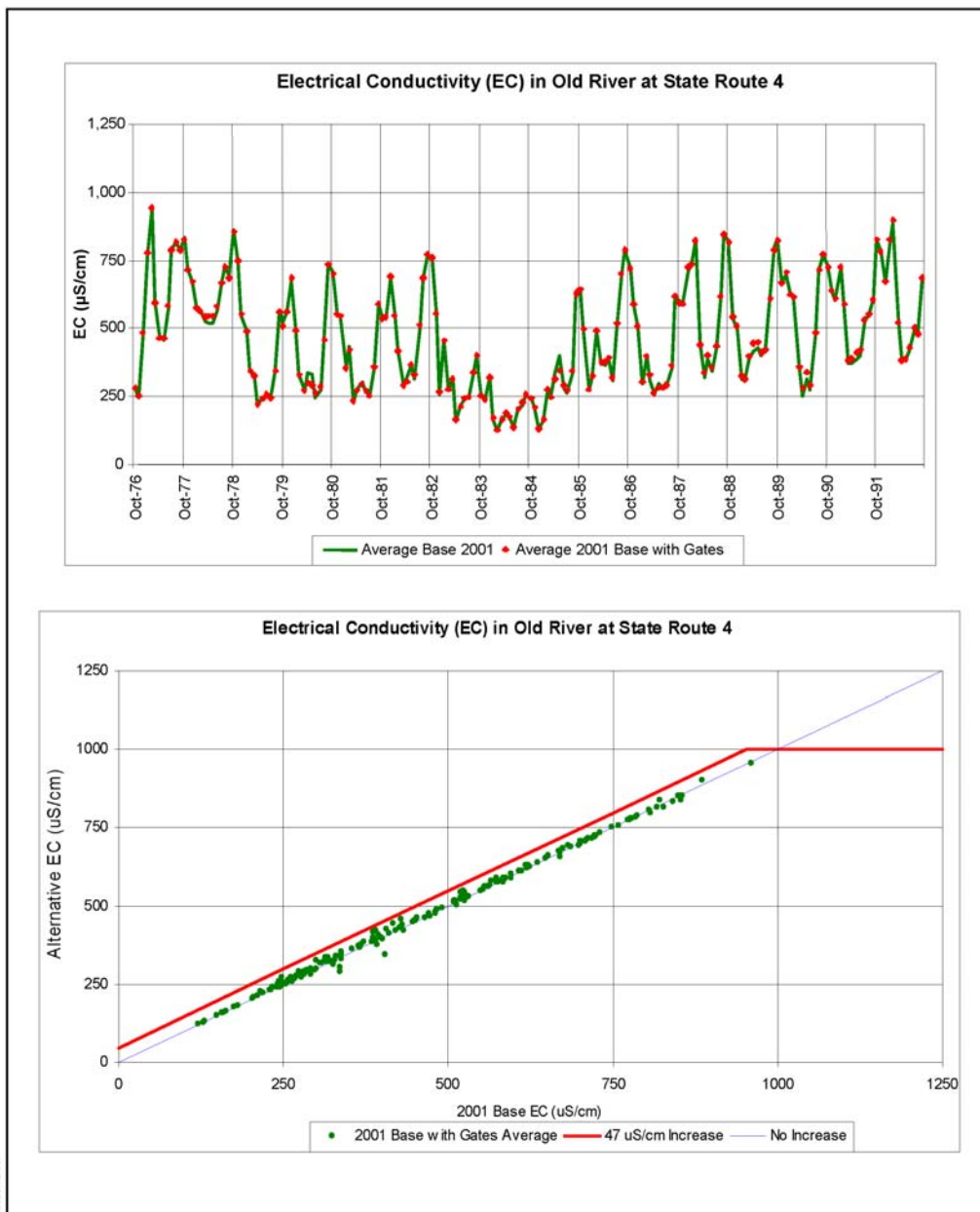
The water quality benefits for Alternative 4B Stage 2 under 2020 conditions are assumed to be the same as the benefits described above for Alternative 4B

South Delta Improvements Program
Draft Environmental Impact Statement/
Environmental Impact Report

5.3-63

October 2005

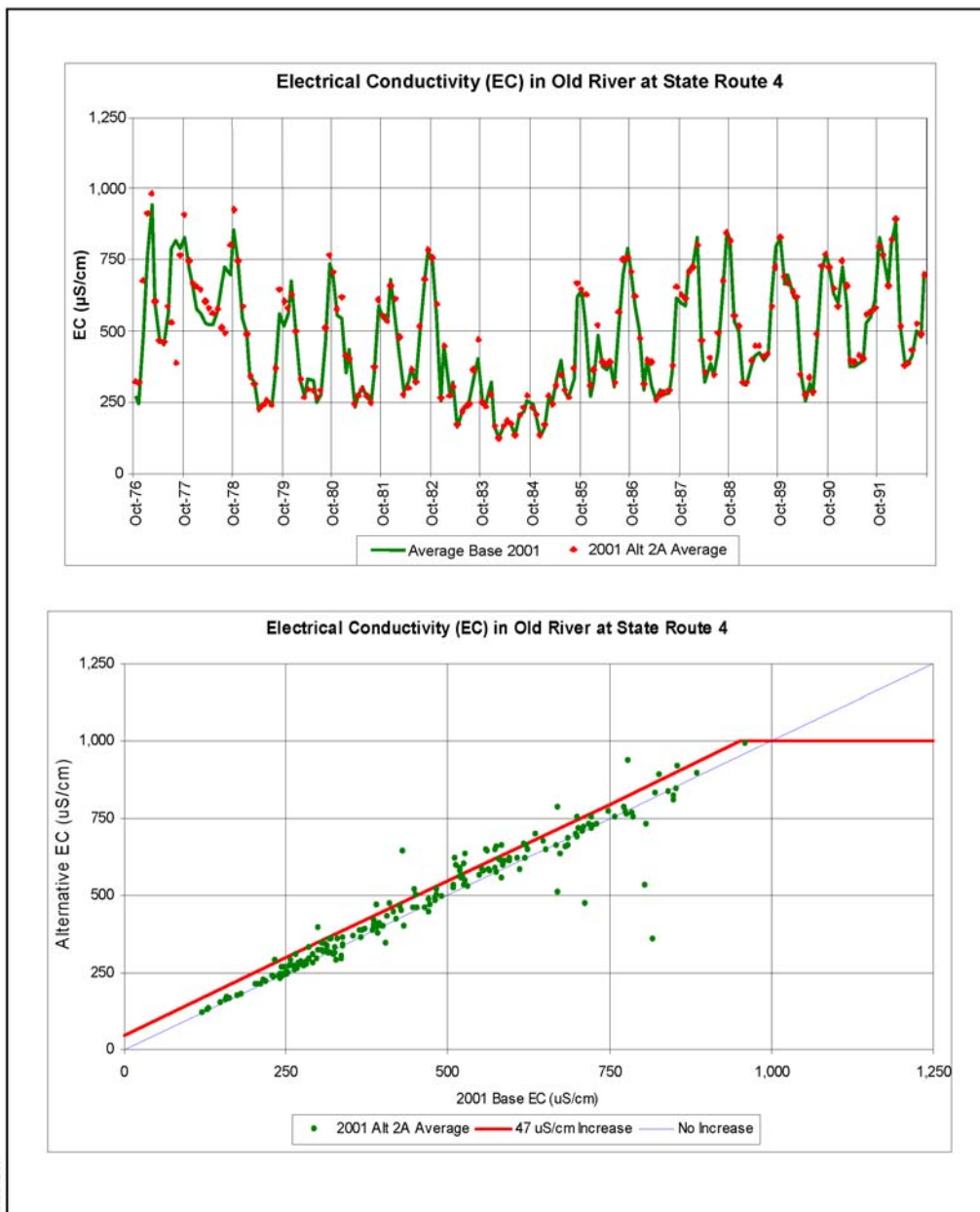
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Figure 5.3-15

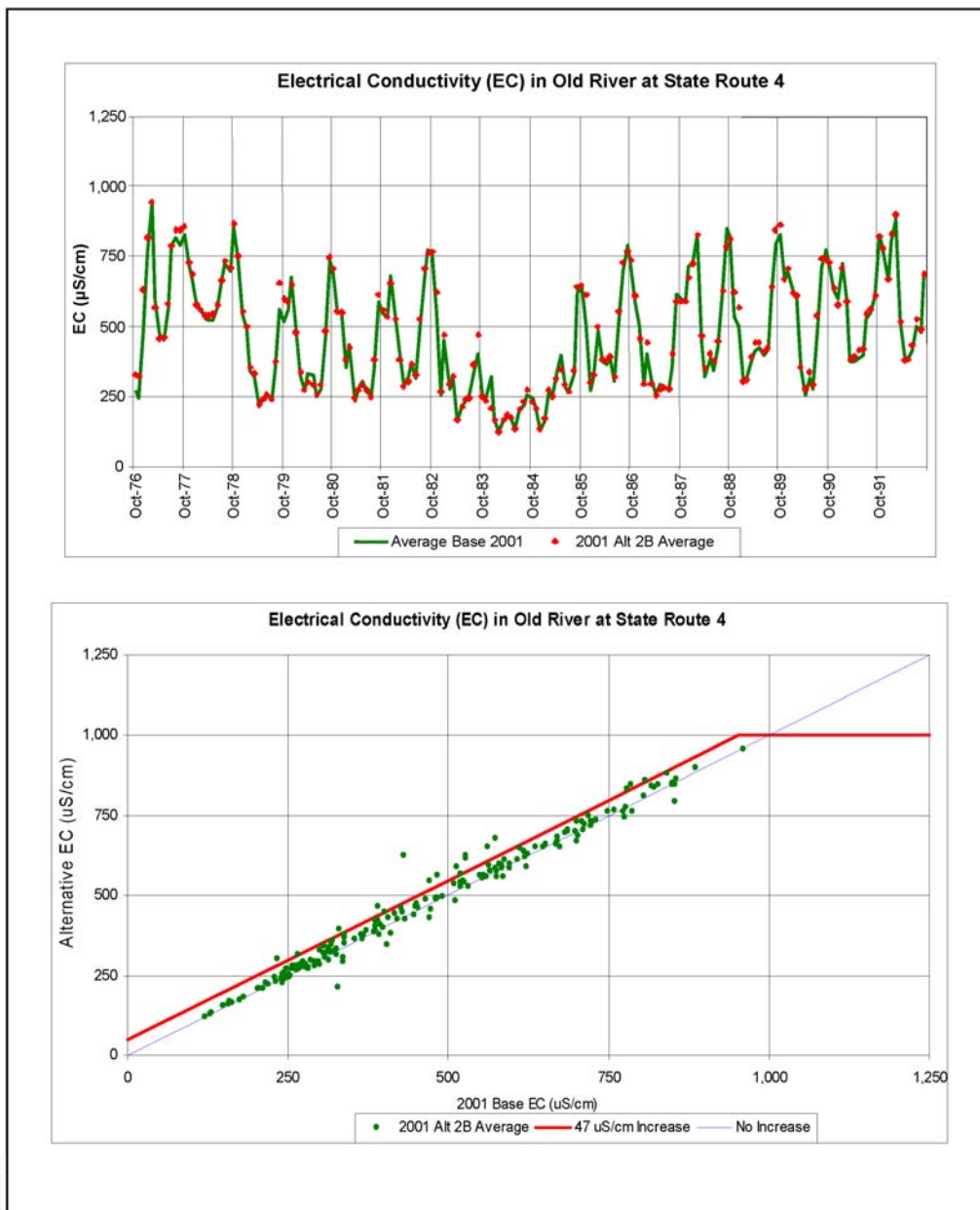
**DSM2-Simulated Monthly Electrical Conductivity in
Old River near State Route 4 Bridge for 1976–1991 with Alternative 2A
Stage I (2001 Base with Gates) Compared with 2001 No Action Baseline**



Jones & Stokes

Figure 5.3-26

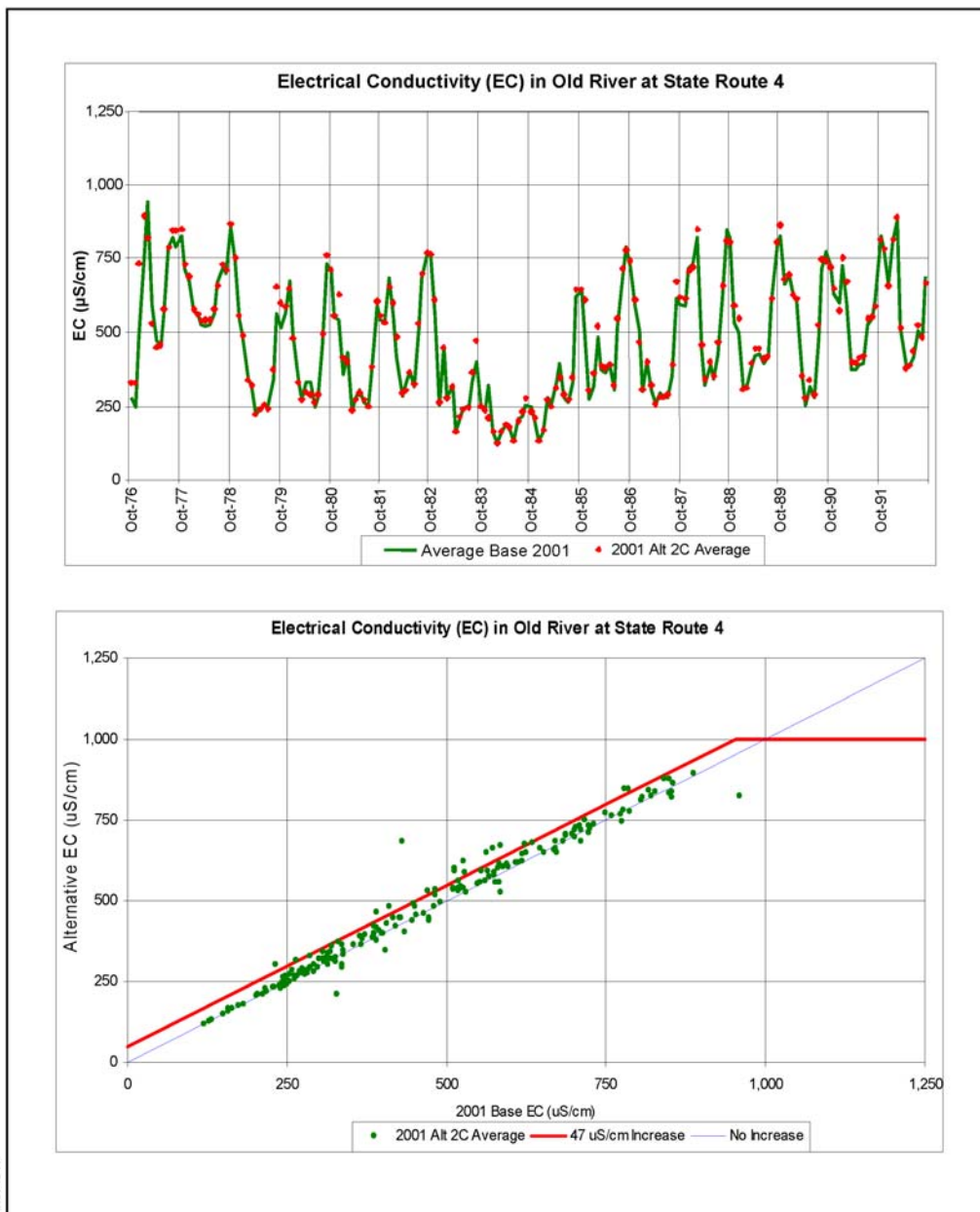
**DSM2-Simulated Monthly Electrical Conductivity in
Old River near State Route 4 Bridge for 1976–1991 with
Alternative 2A Stage 2 Compared with 2001 No Action Baseline**



Jones & Stokes

Figure 5.3-43

**DSM2-Simulated Monthly Electrical Conductivity
in Old River at State Route 4 for 1976–1991 with Alternative 2B Stage 2
Compared with 2001 No Action Baseline**



Jones & Stokes

Figure 5.3-51

**DSM2-Simulated Monthly Electrical Conductivity
in Old River at State Route 4 for 1976–1991 with
Alternative 2C Stage 2 Compared with 2001 No Action Baseline**